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7. Appendix A

This appendix contains the input files for the deposition model. The contents of the main input file `data.dat` are:

```
'        Data file for RegDep program.
         ============================

This file contains the configuration information for the regdep
program for Versions 4.8 and greater.  Deleting any lines, or moving
decimal places may cause the program to crash.

Input type

2

Nebulizer type

2

Aerosol Type

1

Aerosol Characteristics (if Input = 2 only)

 4.0
 1.6
 0900000.0
 1.0

Calculation type

1
0.005

Room information:

22.5
50.0

Solution information:

4.0
72.0
* Drugs
1
'Ventolin'
```

```
001.00
00576.70
1.5
2.5
NoDrug
000.00
00000.00
0.0
0.0
* Suspension info
2
'Budesonide'
000.50
01.6
1.26
* Salts
0
000.00
0
000.00
58.43
2.145
1.85

Breathing information:

0.75
500.0
1.0
50.00
00.00

Nebulizer Flow rate: (if Input = 1 only)

6.4
4.5

Mouthpiece dimensions

4.0
1.40
1.0            Flag, 0=mouthpiece only, 1= lung

COPD Lung   !Modification by LKY 20.6.95

0.0
3.50

Pediatric Lung  !Modification by LKY 11.08.95

0

Calculate effective diameters for alveolar?

0              !flag, 0=no, 1=yes

Lung Geometry
```

```
0.0
2.0
30.0
183.5

Key to data:

Input source

   flag 1= nebulizer
        2=specified aerosol

Nebulizer type

   flag 1=continuous running jet nebulizer
        2=vented jet nebulizer
        3=ultrasonic nebulizer

Aerosol Type

   flag (1 = non-hygroscopic aerosol
         2 = initially solid, hygroscopic aerosol
         3 = liquid hygroscopic aerosol)

Aerosol Characteristics (if Input = 2 only)

   mass median diameter of aerosol
   geometric standard deviation of aerosol
   approximate number of particles per cc in the aerosol
   bin width (min=0.1 max=9.9)

Calculation type

   flag (1 = tracks single particle of each size through respiratory
tract
         2 = uses Lagrangian multiphase approach to solve heat and
vapour
             transport equations through respiratory tract)
   RERR relative error in the implicit solver.  For Lagrangian
mulitphase only

Room information:

   temperature (degrees celcius)
   relative humidity (%)

Solution information:

   initial volume of solution in the nebulizer (ml) (if Input=1 only)
   surface tension of liquid (mJ/sq. m)
* Drugs
   Flag, (1=solution, 2=suspension)
   Name of drug 1 (in ' ')
   initial concentration of drug 1 in the solution (mg/ml)
   molecular weight of drug 1
   density of drug 1
```

```
   van't hoff factor of drug 1
   Name of drug 2 (in ' ')
   initail concentration of drug 2 in the solution (mg/ml)
   density of drug 2
   van't Hoff factor of drug 2
* Suspension info
   flag, 1=suspension,2=solution
   Name of drug (in ' ')
   initial concentration of drug
   CMD of drug particles
   density of drug particles
* Salts
   flag for salt 1 (1=saline, 0=none)
   initial concentration of salt 1 (mg/ml)
   flag for salt 2 (1=saline, 11=other)
   initail concentration of salt 2 (mg/ml)
   molecular weight of salt 2
   density of salt 2
   van't Hoff factor of salt 2

Breathing information:

   tidal volume (litres)
   Inhalation flow rate (cc/s)
   Type of breathing (0=nose breathing, 1=mouth breathing)
   % of breathing cycle where patient inhales
   % of breathing cycle which is the pause between inhalation and
exhalation

Nebulizer Flow Rate: (if Input=1 only)

   neb flow rate (l/min)
   solution temperature drop

Mouthpiece dimensions:

   length
   diameter

COPD Lung Model

   flag (0.0=use healthy lung, 1.0=COPD lung model)
   Total resistance

Pediatric Lung Model

   0=pediatric lung model not used, any other number=age (months)

Lung Geometry

   flag (0 = no scale use population averages, 1 = scale for an
individual)
   sex (1=female, 2=male)
   age (years)
   height (cm)
```

The information on the mass lost from the nebulizers is contained in the file

NebInfo.dat:

```
Time    Av Neb Mass Error
1st min 1.1233

Concentration at end of Nebulization period
1.33356

Mass of solids collected on filter (vented jet neb only)
0.3000

Notes:

For a continuous running jet nebulizer, the "Av Neb Mass" is the
change in the nebulizer mass each minute.  Measuring this each
minute will result in the most accurate results from the model.
In the "Concentration...." field, the concentration of the solution
in the nebulizer bowl should be entered.  This value should be
the increase in concentration relative to the initial concentration

For a vented jet nebulizer, the mass of water collected on the
filter for the entire run should be entered in the "Av Neb Mass"
spot, with the number of minutes set to 1.  No errors are needed.
The "Mass of solids collected on filter" is the number of milligrams
of salt and drug collected on the filter over the entire run.
The concentration field is not used for vented jet nebulizers.
```

The names of the PDA files for the size measurement are contained in the file

FileNames.txt:

```
This file contains the names of the data files from
the Dantek system.  This file is for versions 4.2
and later of the code.  See note at end for info on vented jet nebs

Number of Data Files

1
9

Number of classes in the data files
```

```
185

Data file for 1st minute

'neb1.ct0'
'neb1.ct1'
'neb1.ct2'
'neb1.ct3'
'neb1.ct4'
'neb1.ct5'
'neb1.ct6'
'neb1.ct7'
'neb1.ct8'
'neb1.ct9'

Data files for 2nd minute

'12.prn'
'22.prn'
'32.prn'
'42.prn'
'52.prn'
'62.prn'
'72.prn'
'82.prn'
'92.prn'

Data files for 3rd minute

'13.prn'
'23.prn'
'33.prn'
'43.prn'
'53.prn'
'63.prn'
'73.prn'
'83.prn'
'93.prn'
'103.prn'

Data files for 4th minute

'14.prn'
'24.prn'
'34.prn'
'44.prn'
'54.prn'
'64.prn'
'74.prn'
'84.prn'
'94.prn'
'104.prn'

Data files for 5th minute

'15.prn'
'25.prn'
```

```
'35.prn'
'45.prn'
'55.prn'
'65.prn'
'75.prn'
'85.prn'
'105.prn'

Data files for 6th minute

'16.prn'
'26.prn'
'36.prn'
'46.prn'
'56.prn'
'66.prn'
'76.prn'
'86.prn'
'96.prn'
'106.prn'

NOTE:

For vented jet nebulizers, the number of minutes should be set to 1.
This is because the solution concentration in the particles is average
over the entire tun time.  Multiple PDA measurements should be taken,
and can be averaged here.

For suspension drugs, the number of minutes is automatically set to 1.
```

1. Apendix B

The main output from the deposition model is contained in the file `results.out`:

```
Program Output
==============

 Test type: Vented jet nebulizer

Test Conditions:

 Ambient Temperature: 296.1
 Ambient RH:           55.0

 Uncoupled particle and ambient phases

The lung is for an average person (6000cc)
at 51% TLC (3050cc)
```

```
Breathing Conditions:

 Tidal Volume (cc):    750.0
 Inspiration Flow Rate (cc/s):    300.0
 Breathing cycle inhalation percent: 50.00
 Breathing cycle holding percent:    .00

Initial Solution data:

 Drug type: Solution
 Volume of liquid in nebulizer (ml):  2.50
 Drug 1: 'Ventolin'
 Initial concentration of drug 1 (mg/ml):    1.00

 Salt 1:Saline
 Initial Concentration of salt 1 (mg/ml):    9.00


 Aerosol MMD (micrmetres):  6.02
 Aerosol GSD:  1.74


Regional Dosage (mg, (std dev))

'Ventolin'
     ExtraTh:        .16736    (     .07068)
     Bronchial:      .22416    (     .08851)
     Alveolar:       .08467    (     .02943)

 Total Delivered Dose (mg):       .476192

 Inhaled Mass (mg):      .553110

 Percent drug delivered to each compartment
     ExtraTh:       6.694256
     Bronchial:     8.966582
     Alveolar:      3.386846
     Total:        19.047683


**********************************************

If you have drug in your solution, the dosage
   delivered is DRUG only, if you do not have
   drug, then the dosage is salt
Deposition probs are available in "out.out"
Particle sizes and temperature and RH in each
   generation are available in "size.out"
Dosage delivered to each generation is
   available in "gendose.out"
Dosage delivered to each compartment per minute
   is available in "dosage.out"

Tue Dec  3 06:39:30 1996

/v/kevin/regdep/pari/2/neb1/
Code Version 5.3
```

The distribution of the aerosol output by the nebulizer after correction for the optical depth of the cloud is output in `distribution.out`

```
Number density of inhaled particles

 NOTE:  for nebulizers delivering a suspended
        drug, these numbers should be divided
        by the nebulizer run time (min).

   Total Number density            852202.1

 Class Breakdown


 Minute number  1

 Class            Number of particles (per cc)
     1                      138.4
     2                      645.7
     3                     1614.3
     4                     3090.2
     5                     6826.1
     6                    14482.4
     7                    26197.5
     8                    43262.7
     9                    66739.0
    10                    88185.9
    11                    91230.0
    12                    93351.6
    13                    77531.6
    14                    60973.7
    15                    47321.5
    16                    36805.6
    17                    29610.5
    18                    24168.1
    19                    21124.0
    20                    16327.3
    21                    15497.1
    22                    12406.9
    23                    11715.1
    24                     9501.2
    25                     7794.7
    26                     6780.0
    27                     5488.6
    28                     4796.7
    29                     3828.2
    30                     3643.7
    31                     2767.3
    32                     2490.6
    33                     2260.0
```

```
    34                    1937.1
    35                    1568.2
    36                    1568.2
    37                    1291.4
    38                    1199.2
    39                    1106.9
    40                     876.3
    41                     691.8
    42                     553.5
    43                     507.3
    44                     461.2
    45                     276.7
    46                     322.9
    47                     276.7
    48                     230.6
    49                     138.4
    50                      92.2
    51                     138.4
    52                     138.4
    53                      46.1
    54                      46.1
    55                        .0
    56                      46.1
    57                      46.1
    58                      46.1

Tue Dec  3 06:39:30 1996

/v/kevin/regdep/pari/2/neb1/
Code Version 5.3
```

The deposition model also outputs the size of each droplet class at the end of each generation of the Weibel lung along with the temperature and relative humidity of the air. Additionally, the dosage delivered by each particle size class to each individual generation is available. These files are not included here for space considerations